Date:

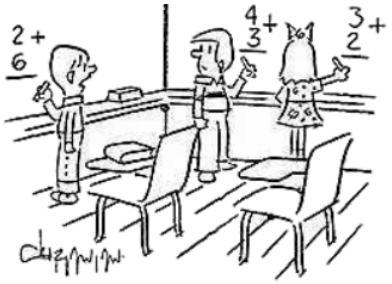
Lesson Title: 3.2 Linear Plots

Objective: To explore the connection between graphs and tables and how they can be used to solve problems.

IN:

Create a Recursive Routine and fill in a table. Be prepared to share the starting value and the rule.

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
25	



"The path to becoming an astronaut is rougher than I thought."

Remember when we used a recursive routine on our calculator to complete the table below?

The table shows heights above and below ground at different floor levels in a 25-story building.

Was there a better way to keep track of how many times you hit enter?

Floor number	Height (ft.)
0	-4
1	9
2	22
3	35
4	
5	
6	
7	
8	
9	
10	
25	

How we did it before:

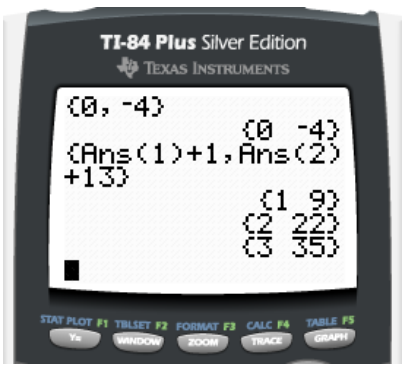
The calculator screen shows how to enter the recursive routine into your calculator.

- Press -4 --> ENTER to start your number sequence.
- Press +13 --> ENTER. The calculator automatically displays ANS + 13 and computes the next value.
- Press ENTER again. The calculator applies the rule for finding successive floor heights.

Let's try it this way:

- Press {0,-4} --> ENTER to input both starting values at the same time.
- Press {Ans(1)+1, Ans(2)+13} --> ENTER. The calculator automatically computes the next value.
- Press ENTER again. The calculator applies the rule for finding successive floor numbers and heights.

This is called a calculator list in the investigation.



On the Road Again investigation

A green minivan starts at the Mackinac Bridge and heads south for Flint on Highway 75. At the same time, a red sports car leaves Saginaw and a blue pickup truck leaves Flint.

The car and the pickup are heading for the bridge. The minivan travels 72 mi/h. The pickup travels 66 mi/h. The sports car travels 48 mi/h.

When and where will they pass each other on the highway?

On the Road Again investigation

Investigation Handout

Complete steps 1-5

Step 1:
Find each vehicle's average speed in miles per minute (mi/min).

Step 2:
Write recursive routines to find each vehicle's distance from Flint at each minute.

What are the real-world meanings of the starting value and the rule in each routine? Use calculator lists.

Step 3:

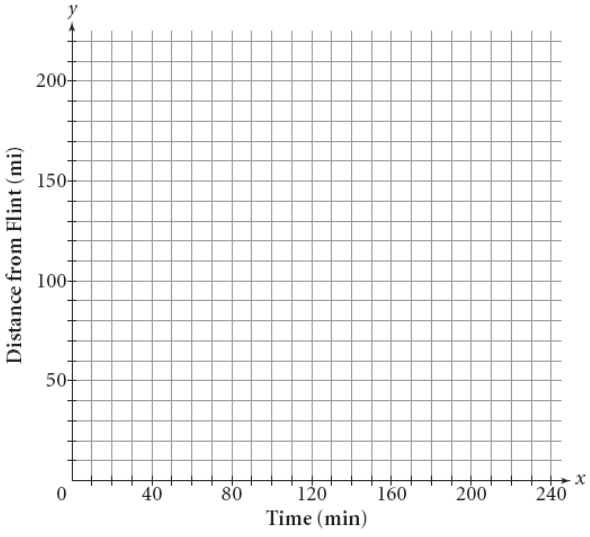
Make a table to record the highway distance from Flint for each vehicle. After you complete the first few rows of data, change your recursive routines to use 10 min intervals for up to 4 h.

Highway Distance from Flint

Time (min)	Minivan (mi)	Sports car (mi)	Pickup (mi)
0			
1			
2			
5			
10			
20			

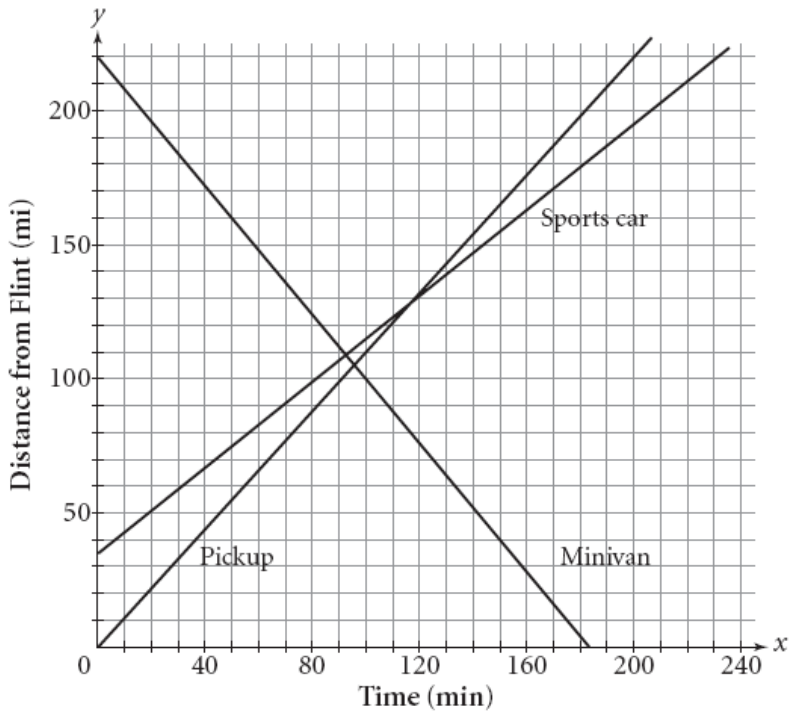
Step 4:

Define variables and plot the information from the table onto a graph. Mark and label each axis in 10-unit intervals, with time on the horizontal axis. Using a different color for each vehicle, plot its (time, distance) coordinates.



Step 5:

On the graph, do the points for each vehicle seem to fall on a line? Does it make sense to connect each vehicle's points in a line? If so, draw the line. If not, explain why not.



Step 6:
Where does the starting value for each routine appear on the graph? How does the recursive rule for each routine affect the points plotted?

Step 7:
Which line represents the minivan? How can you tell?

Step 8:
Where are the vehicles when the minivan meets the first one headed north?

Step 9:

How can you tell by looking at the graph whether the pickup or the sports car is traveling faster? When and where does the pickup pass the sports car?

Step 10:

Which vehicle arrives at its destination first? How many minutes pass before the second and third vehicles arrive at their destinations? How can you tell by looking at the graph?

Step 11:
What assumptions about the vehicles are you making when you answer the questions in the previous steps?

Step 12:
Discuss how these questions affect the recursive routines, tables, and graphs:

What if the vehicles are traveling at different speeds?

What if one driver stops to get gas or a bite to eat?

What if the vehicles' speeds are not constant?

APPLICATION A car is moving at a speed of 68 mi/h from Dallas toward San Antonio. Dallas is about 272 mi from San Antonio.

a. Write a recursive routine to create a table of values relating time to distance from San Antonio for 0 to 5 h in 1 h intervals.

b. Graph the information in your table.

APPLICATION A car is moving at a speed of 68 mi/h from Dallas toward San Antonio. Dallas is about 272 mi from San Antonio.

c. What is the connection between your plot and the starting value in your recursive routine?

d. What is the connection between the coordinates of any two consecutive points in your plot and the rule of your recursive routine?

APPLICATION A car is moving at a speed of 68 mi/h from Dallas toward San Antonio. Dallas is about 272 mi from San Antonio.

e. Draw a line through the points of your plot. What is the real-world meaning of this line? What does the line represent that the points alone do not?

f. When is the car within 100 mi of San Antonio? Explain how you got your answer.

APPLICATION A car is moving at a speed of 68 mi/h from Dallas toward San Antonio. Dallas is about 272 mi from San Antonio.

g. How long does it take the car to reach San Antonio? Explain how you got your answer.

7. APPLICATION A long-distance telephone carrier charges $1.38 for international calls of 1 minute or less and $0.36 for each additional minute.

a. Write a recursive routine using calculator lists to find the cost of a 7-minute phone call. @

7. APPLICATION A long-distance telephone carrier charges $1.38 for international calls of 1 minute or less and $0.36 for each additional minute.

b. Without graphing the sequence, give a verbal description of the graph showing the costs for calls that last whole numbers of minutes. Include in your description all the important values you need in order to draw the graph.

Summary:

How do tables and graphs relate?

What does the rate of change look like for a linear relationship?

When will a line rise from left to right on a graph?

When will a line fall from left to right on a graph?

Out: Explain the calculator steps needed to find the 24th number in a recursive sequence that has a starting value of -20 and adds 17 to each new value.

End of Class - Have a Great Day!!!